



Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at <http://about.jstor.org/participate-jstor/individuals/early-journal-content>.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

desired. In chapter two the Pompeian graffiti and lead and wax tablets are briefly treated. Chapter three, which fills pages 32-224, gives 141 papyri (several ostraka are included) with a detailed description for each papyrus of all the letters, the abbreviations, and the ligatures, and includes 18 plates (unpaged) with facsimiles of 43 alphabets. This chapter, together with chapter four, which gives a Summary History of the Roman Cursive Alphabet, taking each letter and tracing its development, is a monument of painstaking diligence. Appendix 2—there are three in all—is a very complete bibliography. Ten tables of alphabets complete the book. Tables A, B, C, D give the different forms of all the letters of respectively the Pompeian graffiti, lead tablets, Pompeian wax tablets, and Dacian wax tablets. Tables 1-6 give the different forms of the letters in the papyri, the arrangement being a chronological one. Tables 1-5 give the letter forms from c. 17 B. C. to 491 A. D., and give space for as many as 30 different forms for each letter. Table 6 which shows the letters of papyri dating from 504-639 A. D. is so scrupulously done that there are 82 different forms shown for the letter b, 87 for g, 90 for o, 92 for e, and 96 each for i and for t. The reviewer finds that this book merits nothing but praise.

R. V. D. MAGOFFIN.

Robert of Chester's Latin Translation of the Algebra of Al-Khowarizmi, with an Introduction, Critical Notes and an English Version, by LOUIS CHARLES KARPINSKI. The Macmillan Company, 1915.

This work is a contribution to the history of mathematics, being Part I. of Contributions to the History of Science, in the University of Michigan Studies, Humanistic Series, Volume XI.

A brief preface explains the nature and scope of the work. An introduction of sixty-three large pages constitutes in some respects the most important part of the work. This is followed by the Latin text on left-hand pages with critical notes underneath and on right-hand pages the English version with the solutions of problems with modern algebraic notation underneath. A Latin glossary is added in which are noted many departures from classical usage.

An epitome of the introduction would be useless even if it were possible to make one. A concise list of the contents must here suffice: I. Algebraic analysis before Al-Khowarizmi. II. Al-Khowarizmi and his treatise on Algebra. III. Robert of Chester and other translators of Arabic into Latin. IV. The

influence of Al-Khowarizmi's Algebra upon the development of mathematics. This chapter is specially important. V. The Arabic text and the translations of Al-Khowarizmi's Algebra. VI. Preface and additions found in the Arabic. This preface, omitted in the Latin translations, is here published from Rosen's English version. Its omission from the Latin translations was no doubt due to its recognition of Mohammed as The Prophet. The Arabic text contains also an extended discussion of inheritance problems, exceeding in volume the Algebra proper. VII. Manuscripts of Robert of Chester's translation. Besides some fragments there are three MSS of this version, one each in Vienna, Dresden, and New York (Columbia University). These are compared and their relations to each other discussed with great acumen. Photographic reproductions of one page of each MS are inserted.

To the text of the Algebra proper there are added from a Dresden MS some "Rules corresponding to the six chapters of Algebra", in which a peculiar notation is used; and then follow thirty pages of additions from the Columbia University MS. These additions were made by Johann Scheybl, Professor of Mathematics at Tübingen 1550-70.

It may be worth while to state some historical facts concerning the Arabian author and his translator, and make some comments on the whole work.

The real name of the author was "Mohammed ibn Musa", that is, Mohammed son of Moses. "Al-Khowarizmi" is "the Khowarizmian", from Khowarizm (now Khiva), the place of his birth. Several dictionaries and cyclopedias give his name erroneously, mistaking a prefix or title for the name. His designation, "al-Khowarizmi", has given us the word "algorithm", from the Latin form "Algorismus" which was sometimes used also of arithmetic.

The dates of his birth and death are unknown, but it is well established that he was at the height of activity about A. D. 825. He wrote several books,—on arithmetic, astronomy, geography, chronology, the sun-dial, the astrolabe, etc., most of which are lost.

Robert of Chester translated other Arabic works, including the Qoran, into Latin. It was he, and not Robertus Anglicus, as usually stated, who translated the "*Judicia Alkindi astrologi*". He wrote the version of the Algebra in 1145.

The English version before us, as the author says, is rather a paraphrase than a translation, "in phraseology which the modern student of mathematics will find easy of comprehension". In consequence the version would mislead if not accompanied by the Latin text.

The Latin of Robert is such as Latin usually was in his day. Some words had to be used in a new sense. A Latin scholar

would hardly suspect that "*Medietas substantiae et quinque radices 28 coaequantur drachmis*" means what we should express by $\frac{1}{2}x^2 + 5x = 28$. Robert uses "drachma" for unit; Scheybl uses "denarius". The unknown square (x^2) is "substantia" or "census", and the first power (x) is "radix" or "res", not to mention other strange usages.

The Algebra is made up chiefly of solutions of the various forms of quadratic equations, the rules by which they are solved, and geometrical demonstrations of the correctness of the rules. The solutions are identical with those of to-day, but only words without notation are employed. The problems are usually stated as equations of the second degree and deal with abstract numbers. Sometimes, however, they require some thought before the equation is stated and deal with concrete things, in which case the equation may be of the first degree. The abstract and concrete may be mixed, as when "a unit is divided among girls" (p. 119). There is a chapter on mercantile transactions which really treats of proportion. The additions made by Scheybl contain nothing important. One problem with its solution deserves special mention: "I divided a drachma and one-half between a man and a part of a man, and to the man there fell the double of that which fell to the part [of a man]. The question is, how large was the part?" By means of a quadratic equation he shows that it was one-half of a man!

It is worthy of note that among those that wrote algebras based directly or indirectly upon Al-Khowarizmi was Omar ibn Ibrahim al-Khayyami, better known as Omar Khayyam (about 1045-1123 A. D.), and that one Mohammed al-Qasim, of Granada, wrote a poem treating of algebra (now in the Escorial), not to be confounded with the "*Carmen de Algorismo*" of Alexander de Villa Dei (about 1220), which, with the "*Algorismus Vulgaris*" by John of Halifax (about 1250), was chiefly instrumental in introducing the Arabic numerals into Europe.

The title of the Algebra, still used in Mohammedan schools, is *al-jabr w'al-muqabala* (in the Latin, "*Algebra et Almucabola*"), meaning "the restoration (or making whole) and the opposition (or balancing)". One would suppose that these words referred to the completion of the square and the equating of the second member to the first; but Professor Karpinski, correctly it would seem, holds that the one refers to the transference of negative terms and the other to the combination of like terms with possible cancellation.

Professor Karpinski contends that the Algebra of Al-Khowarizmi was not derived from a Greek source. Algebraic analysis had been employed by Greek and other mathematicians, but "with such evidence as we now have we must regard him as the first to bring out sharply the parallelism between the analytical and [the] geometrical solutions of quadratic equations".

Professor Karpinski has done his work excellently and has made an important contribution to the history of mathematics, correcting several prevalent errors.

MILTON W. HUMPHREYS.

UNIVERSITY OF VIRGINIA.

The Beasts, Birds, and Bees of Virgil, by THOMAS FLETCHER ROYDS, Oxford. B. H. Blackwell, 1914. pp. I-XX, 1-107.

Mr. Warde Fowler, who contributes the preface, says that "no book of classical antiquity makes quite such a strong appeal to Englishmen as the Georgics." He thinks Mr. Royds' notes the "best commentary we have for the naturalist, the farmer or the sportsman." Mr. Royds says the main object of his book is "to discover Virgil's meaning and to bring it into relation with modern knowledge." It does not pretend to be a complete commentary on his "natural history." The notes are unaccompanied by a translation and, as Mr. Royds himself says, are not always strictly relevant to an exposition of Virgil. The scientist may not be entirely satisfied with the book, for it falls short of being, as its sub-title claims, a naturalist's hand-book to the Georgics. It contains much interesting and valuable information, some of which is new. The notes exhibit wide reading, if not altogether systematic treatment.

In part I., the description of a well-bred horse in Georgics III. 75-88 offers a fair example of the range of the notes. Sixteen authorities or parallels are cited: Ennius, Xenophon, Buffon, Whyte-Melville, Isaiah, Homer, Micah, The Field, Job, Shakespeare, Layard, Lucretius, Aeschylus, Byron, Kingsley, and Conington. The Gadfly III. 146-151 gets a good note and the reference in III. 250-54 to "hippomanes" calls forth some odd comments. Virgil's fondness for goats is noted under III. 300, and his love of hunting under III. 409-13. "He was a sportsman at heart in spite of his natural sympathy for animals." The beautiful passage, III. 515-30, and the conclusion of the book, 547-end, show Virgil's "power to raise his subject to the highest level" and his "skill as an artist in handling his theme." Comments on the Ant, the Cicada, the Mus, Talpa and Curculio conclude Part I.

Part II. gives the notes on birds. The *Corvus* is found to be the rook and the *cornix* is either the crow or the raven. *Hirundo* is sometimes our swallow and sometimes our house-martin. *Philomela* has not a sad note, is not inspired by sorrow. That the bird sings in June in Italy, the remark of Countess Cesaresco shows: "Take the train to Mantua in June, and nightingales drown the noise of the engine."